

INSTRUCTION BOOK FOR

BIRD

**MODEL 8141
TERMALINE®
LOAD RESISTOR**

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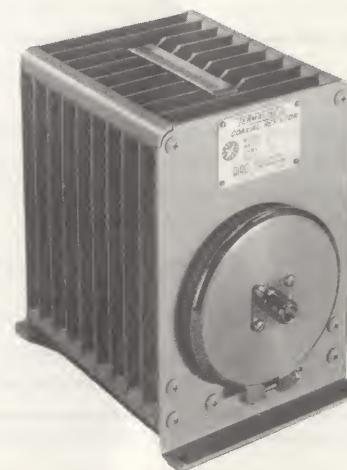
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MODEL COVERED IN THIS INSTRUCTION BOOK

8141

INSTRUCTION BOOK FOR MODEL 8141 TERMALINE® LOAD RESISTOR



BIRD

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SAFETY PRECAUTIONS

The following are general safety precautions that are not necessarily related to any specific part or procedures and do not necessarily appear elsewhere in the publication.

Keep away from live circuits.

Operating personnel must at all times observe normal safety regulations. Do not replace components or make adjustments inside the equipment with the high voltage supply turned on. Under no circumstances should any person reach into the enclosure for the purpose of servicing or adjusting the equipment except in the presence of someone who is capable of rendering aid. Personnel working with or near high voltage should be familiar with modern methods of resuscitation.

The following will appear in the text of this publication and is shown here for emphasis.

CAUTION

Do not operate this equipment over the rated 250W continuously.
Damage to the resistive element could result.

WARNING

Never attempt to disconnect the load from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard.

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MODEL 8141 TERMALINE® LOAD RESISTOR

INTRODUCTION

PURPOSE AND FUNCTION

The Bird Model 8141 TERMALINE® Load Resistor is a portable, general purpose 50 ohm coaxial transmission line termination. It is a self-contained unit requiring no outside power source or additional equipment. The Model 8141 TERMALINE® Coaxial Load Resistor provides an accurate, dependable, and practically nonreflective termination for adjustment, standby and testing of transmitters under nonradiating conditions from dc to 2500MHz.

The Model 8141 is rectangular in shape with transverse cooling fins spaced evenly along its entire length. Its short length makes it particularly useful in locations where the length of Models 8401 or 8201 would not be easy to place. Also, the ten pounds total weight is a convenience in portable use. Mounting holes are provided, see Section I - Installation.

The RF connector, on the front face of the unit, is a Female N similar to UG-58A/U, but is a "Quick-Change" design permitting rapid and easy interchange with other AN type connectors.

PERFORMANCE CHARACTERISTICS AND CAPABILITIES

The Model 8141 will absorb and dissipate as heat up to 250W of RF power in continuous duty. It can handle up to 20 percent overload for a maximum of ten minutes overload without damage, provided a half-hour interval is maintained for cooling between power applications. The design of the resistor and its impedance matching shell keeps the VSWR below 1.1 to 1.0 from dc to 1000MHz, 1.2 to 1.0 from 1000 to 1800MHz and 1.3 to 1.0 from 1800 to 2500MHz. With its "QC" type of connector Model 8141 can be adapted to coaxial cables equipped with any of a variety of standard connectors.

DIMENSIONS AND WEIGHT

The Model 8141 is 9-9/16" L x 5-15/16" W x 8-1/2" H (243 x 151 x 216mm). It has a net weight of 10 pounds (4.5kg) and a shipping weight of approximately 14 pounds (6.4kg).

POWER AND UTILITY REQUIREMENTS

Other than the RF power input the Model 8141 has no need for an external source of power or utility services.

ENVIRONMENTAL REQUIREMENTS

The Model 8141 should be operated in as clean and vibration free an environment as possible. The ambient temperature range should remain within -40°C to +45°C (-40°F to +113°F) for proper operation.

ITEMS FURNISHED

Because the Model 8141 is a self-contained unit, there are no additional parts other than this instruction book supplied. The load is pre-filled at the factory with the proper amount of coolant.

ITEMS REQUIRED

No additional items are required other than a coaxial cable for connecting the RF source to the Model 8141. Because the load is furnished with a Female N type connector the cable should be equipped with a Male N type plug. If the cable has any other type of standard connector, then the Model 8141 should be ordered with the appropriate type of mating connector.

TOOLS AND TEST EQUIPMENT

Only simple tools such as screwdriver are needed for disassembling the Model 8141 for service. An ohmeter or resistance bridge with an accuracy of 1 percent or better at 50 ohms, is useful for checking resistor condition.

SPECIFICATIONS FOR MODEL 8141 TERMALINE® LOAD RESISTOR

Impedance	.....	50 ohms nominal
VSWR		
dc-1000MHz	.....	1.1:1 maximum
1000-1800MHz	.....	1.2:1 maximum
1800-2500MHz	.....	1.3:1 maximum
Connectors	.....	Bird Quick Change "QC" Female N Normally Supplied.
Power Range	.....	250W continuous, 300W intermittent (10 minutes maximum)
Frequency Range	.....	dc to 2500MHz
Dimensions	.....	9-9/16" L x 5-15/16" W x 8-1/2" H (243 x 151 x 216mm)
Ambient Temperature	.....	-40°C to +45°C (-40°F to +113°F)
Weight	.....	10 lbs. (4.5kg)
Operating Position	.....	Horizontal only
Finish	.....	Light navy grey baked enamel (MIL-E-15090)

SECTION I - INSTALLATION

1-1. GENERAL

1-2. Locate the Model 8141 TERMALINE® Load Resistor to provide at least six inches of unobstructed space around and above the unit. Place the load to permit the shortest possible cable length between the unit and the transmitting equipment.

1-3. Operate the Model 8141 in a horizontal position only, with the handle on top. The load may be free-standing or fastened to any convenient flat surface. The front and rear fins are made extra thick and bent outward 90° to form mounting flanges. Fasten the Model 8141 by its mounting brackets with 1/4 machine screws and nuts or No. 12 wood screws if desired. The four 9/32 inch holes in the mounting brackets form a base rectangle of 7-15/32" x 5-1/8" (189.7 x 130.2mm).

SECTION II - THEORY OF OPERATION

2-1. GENERAL

2-2. The Model 8141 TERMALINE® Load Resistor consists essentially of a cylindrical film type resistor immersed in a dielectric coolant. The resistor, individually selected for its accuracy, is enclosed in a special tapered housing which provides a linear reduction in surge impedance directly proportional to the distance along the resistor. This produces the uniform, practically reflectionless line termination over the stated frequencies of the load.

2-3. The dielectric coolant is chosen for its desirable electrical properties and thermal characteristics. Cooling of the load is accomplished by natural fluid and air convection. The 0.35 gallon (1.3 liters) of dielectric coolant carries the electrically generated heat from the resistor to the walls of the cylindrical cooling tank. The tank is encased in a set of heavy gauge aluminum radiator fins, which are firmly pressed on the cylinder. The heat from the dielectric oil is transferred to the surrounding air through the fins by natural convection.

2-4. A synthetic rubber diaphragm located in the rear dome of the load allows for the expansion of the coolant as the temperature rises.

SECTION III - OPERATING INSTRUCTIONS

3-1. USE AND FUNCTION OF CONTROLS

3-2. The Model 8141 has no operating controls.

3-3. INITIAL ADJUSTMENTS AND CONTROL SETTINGS

3-4. No adjustments or control settings are required.

3-5. START-UP

3-6. Connect the Model 8141 TERMALINE® Load Resistor to the transmitting equipment under test with 50 ohm coaxial cable such as RG-213/U or equal, and a Male N type plug (UG-21E/U or equal) which mates with the RF input connector of the load. After the transmitter has been connected to the load, proceed according to the transmitter manufacturer's instruction.

3-7. Due to the difference in VSWR between the dummy load and the transmitter's antenna, readjustment of the transmitter may be required when returning to the original antenna.

CAUTION

Do not operate this equipment over the rated 250W continuously.
Damage to the resistive element could result.

3-8. The unit will sustain an intermittent input of 300W maximum for up to ten minutes with a half-hour off between power applications.

3-9. NORMAL OPERATION

3-10. The Model 8141 will dissipate 250W of RF power safely and continuously without an operator in attendance.

3-11. OPERATION UNDER EMERGENCY, ADVERSE OR ABNORMAL CONDITIONS

3-12. As stated previously, the Model 8141 can be overloaded to 300W of RF power for a maximum of ten minutes at a time with an interval of at least a half-hour in between to permit the load to cool off. Because of the additional heat that must be given off by the cooling fins under these conditions, touch the load with caution to avoid the possibility of painful burns.

3-13. SHUTDOWN

3-14. The only way to turn off the equipment is to cut off power from the RF generator. Allow sufficient time for the load to cool down after removing RF power before handling it.

3-15. EMERGENCY SHUTDOWN

WARNING

Never attempt to disconnect the load from the transmission line while RF power is being applied. Leaking RF energy is a potential health hazard.

3-16. As stated in 3-13, Shutdown, the only way to turn the equipment off is to shut off power from the RF generator.

SECTION IV - MAINTENANCE

4-1. TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
Leakage of Coolant Oil Around Clamping Band or Radiator Housing	Clamping bands not tight	Tighten slightly with a screwdriver.
	Faulty O-Ring (front)	Replace per Paragraph 4-15.
	Faulty diaphragm (rear)	Replace per Paragraph 4-14.
Excessive Overheating of the Radiator	Transmitter power too high	Reduce transmitter power.
	Coolant oil level too low	Add more coolant oil to the radiator per Paragraph 4-18.
	Over accumulation of dirt on cooling fins	Clean the fins off.
	Faulty RF section assembly, check RDC	Replace per Paragraph 4-15.
High or Low dc Resistance Values Per Paragraph 4-10.	Faulty RF connector	Replace per Paragraph 4-13.
	Loose RF connector	Tighten with a screwdriver.
	Faulty RF section assembly	Replace per Paragraph 4-15.

4-2. CLEANING

4-3. The outside surface of the instrument, especially the cooling fins, should be wiped free of dust and dirt when necessary. Clean the RF input connector with a clean dry cloth. Use an aerosol type nonresidue forming contact cleaner on the inaccessible portions. Take special care to clean the metallic contact surfaces and exposed face of the teflon insulator.

4-4. INSPECTION

4-5. With the rugged and simple construction of the Model 8141 TERMALINE® Load, periodic inspection will be necessary at only about six month intervals. Inspection should include the items listed below:

- a. Oil Leakage - Check for coolant oil seepage from the radiator tank, and particularly at the front and rear near the under side of the clamping band. See 4-1, Troubleshooting Chart if leakage is observed. Check tightness of the clamping screw.
- b. Inspect the Model 8141 TERMALINE® for completeness and general condition of the equipment.

4-6. PREVENTIVE MAINTENANCE

4-7. The Model 8141 requires only nominal routine care. It is designed to operate for long periods of time, if care is taken not to exceed its power handling capabilities.

4-8. The major item of preventive maintenance is cleanliness. Keep the cooling fins clear of accumulated dust and grime. They interfere with the efficient and rapid transfer of heat from the fins to the surrounding air and therefore could cause the unit to overheat. Keep the coolant level up, see Paragraph 4-11. If the exterior shows any signs of rust or corrosion, clean the areas with a fine flint sandpaper and touch up with grey enamel.

4-9. CALIBRATION

4-10. No calibration is required other than checking the dc resistance value of the resistor itself. Check the condition of the load resistor by accurate measurement of the dc resistance between the inner and outer conductors of the RF input connector. Use an ohmmeter or resistance bridge with an accuracy of 1% or better at 50 ohms. The measured resistance should be a nominal 50 ohms, \pm 2 ohms.

4-11. DISASSEMBLY

4-12. There are no special techniques required for the repair or replacement of components in the Model 8141 TERMALINE® Load. A screwdriver is the only tool needed. The following paragraphs outline component removal.

4-13. RF Input Connector - The input connector is a "Quick-Change" design which permits easy interchange with the use of only a screwdriver. This process does not interfere with the essential coaxial continuity of the load resistor RF input or the coolant oil seal. For replacement, proceed as follows:

- a. Remove the four 8-32 x 5/16 pan head machine screws from the corners of the RF connector.
- b. Pull the connector straight out of its socket.

4-14. Coolant Oil and Diaphragm - To examine the coolant oil and diaphragm, remove the diaphragm cover. Proceed as follows:

- a. Stand the load vertically, with the back end up.
- b. Loosen the clamp screw to release the clamping band.
- c. Remove the diaphragm cover and lift the diaphragm from the back end of the radiator tank. The diaphragm should be soft and pliable. If it is hard or shows signs of surface cracks, replace it. (Bird P/N 2430-015).
- d. The coolant level should be about one inch below top of the cylinder. If oil appears contaminated, replace. Use only the specified coolant, Bird P/N 5-1070.

4-15. RF Load Resistor Assembly - To replace the load resistor assembly proceed as follows:

- a. Stand the radiator vertically with RF input connector up.
- b. With a screwdriver, loosen the 10-32 clamping screw on the clamp band that holds the RF section in place. Remove the clamping band.
- c. Lift the RF section straight up and out of the radiator tank. Hold for a short time over tank to allow oil to drain back in.
- d. Inspect the O-Ring seal just inside the sloped flange of the mounting ring. Replace this seal, Bird P/N 5-230, if it shows any evidence of cuts or deterioration such as hardening or surface cracks.

4-16. REASSEMBLY

4-17. RF Input Connector - Reverse the procedures in Paragraph 4-13, to install a new connector. Be sure that the projecting center contact pin on the connector is carefully engaged and properly seated with the mating socket of the load resistor input.

4-18. Coolant Oil and Diaphragm - To reassemble the load after inspecting the diaphragm and coolant oil see Paragraph 4-14 and proceed as follows:

- a. Put the diaphragm back in place on the radiator tank.
- b. Press the cup-like swelling in the center of the diaphragm down into the tank to remove the trapped air bubble. To allow the air to escape, pry the diaphragm away from the edge of the tank. Through the same opening add more oil, if necessary, until the oil level is flush with the top of the tank.
- c. Replace the diaphragm cover and the clamping band. Tighten the clamping screw.

4-19. RF Load Resistor Assembly - Reverse the procedure given in Paragraph 4-15.

SECTION V - PREPARATION FOR RESHIPMENT

5-1. GENERAL

5-2. RF Connector - Wrap and secure the RF connector with tape to keep out foreign material during shipment.

5-3. Packing - Enclose the Model 8141 in a suitably braced and padded shipping container. For the ultimate protection a sturdy corrugated box is recommended.

SECTION VI - STORAGE

6-1. No special preparations for storage are required other than to cover the equipment to keep it free of dust and dirt accumulations. Storage in a dry, dust and vibration free environment is recommended. The storage temperature should preferably remain within the working temperature range of -40°C to +45°C (-40°F to +13°F).

SECTION VII - REPLACEMENT PARTS LIST

7-3. MODEL 8141

ITEM	QTY.	DESCRIPTION	PART NUMBER
1	1	Radiator Assembly	2440-015
2	1	RF Section Assembly	8141-002
3	0.35 gallons (1.3 liters)	Coolant	5-1070-2 (1 Gallon Container)
4	1	Connector, "QC"	*See Below
5	2	Clamp Band Assembly	2430-043
6	1	Seal, O-Ring	5-230
7	1	Diaphragm	2430-015
8	1	Cover, Diaphragm	2430-148

* Available "QC" Type Connectors

N-Female	4240-062	LT-Female	4240-018
N-Male	4240-063	LT-Male	4240-012
HN-Female	4240-268	C-Female	4240-100
HN-Male	4240-278	C-Male	4240-110
LC-Female	4240-031	UHF-Female (SO-239)	4240-050
LC-Male	4240-025	UHF-Male (PL-259)	4240-179

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**QUALITY INSTRUMENTS
FOR RF POWER MEASUREMENT**

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to 250 kilowatts in 50-ohm coaxial line systems.

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